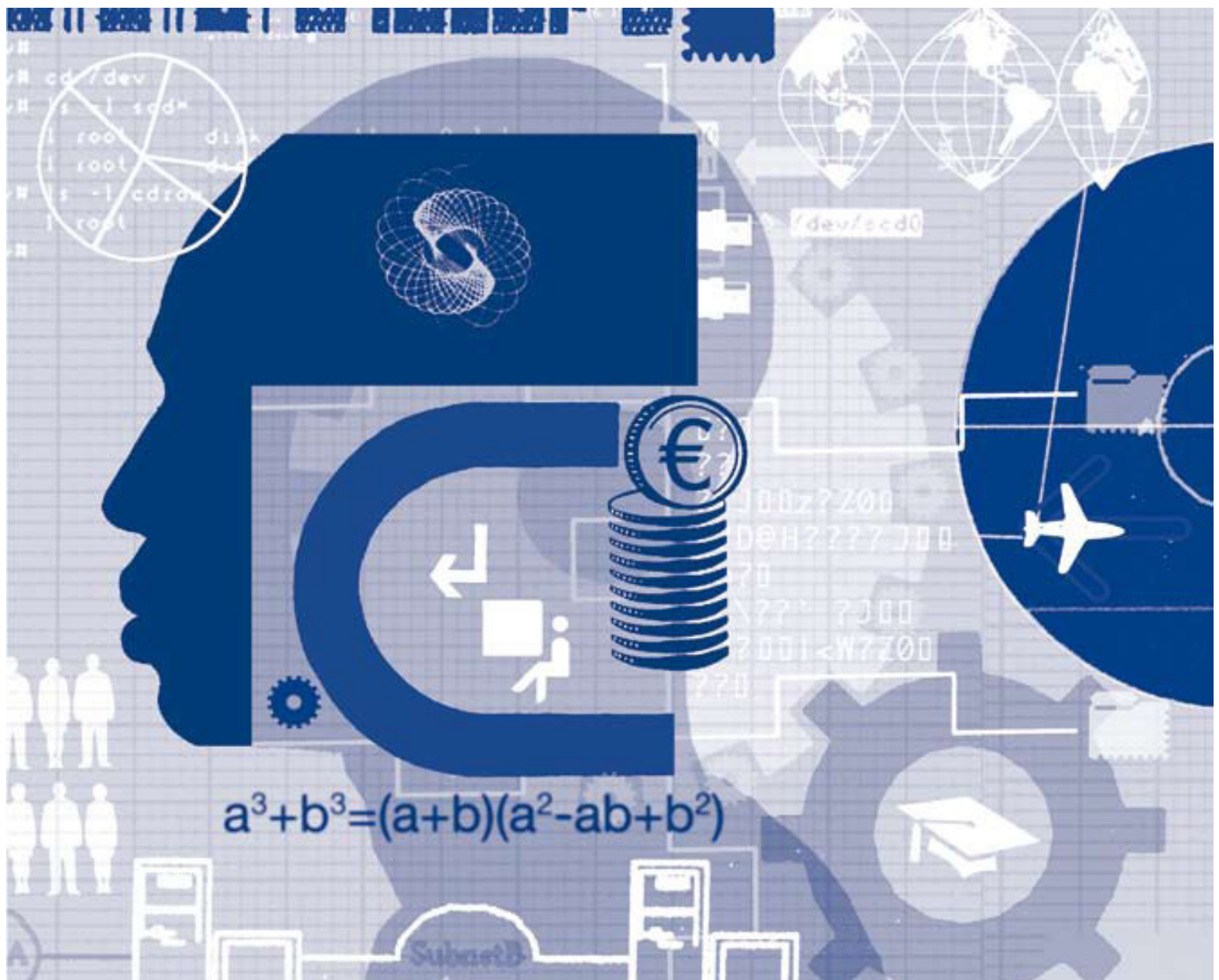


A plan for growth in the knowledge economy

A Knowledge Economy programme paper

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Contents

A vision of a prosperous 2020 knowledge economy	1
The potential of the knowledge economy	4
The foundations of our future knowledge economy	8
The importance of a knowledge economy strategy	20
Towards a plan for the knowledge economy	29
The future of knowledge economy research	31

Acknowledgements

This paper represents the culmination of a two-year programme of research into the knowledge economy. Running since April 2009, the Knowledge Economy 2 programme has provided evidence and policy analysis across a broad range of issues vital to the future of knowledge-intensive work in the UK. This has been made possible by generous support from:



Foreword

The world economy is changing at an unprecedented rate. The forces of globalisation and technological progress are altering the way that people all over the planet make a living. Some countries, especially in the emerging world, are using this wave of change to drive rapid growth in their economies. Other countries, including many in the Eurozone, are struggling to come to terms with these fundamental shifts in the global economic order. In the midst of this, Britain stands at a tipping point, caught between renewed prosperity and a descent into economic stagnation. If the UK is to emerge from the global downturn as a stronger and more stable economy, the next decade will be critical. For the UK to secure its place in the global economy, we need a decade of balanced growth that lays the foundations for our ongoing prosperity. This balanced growth can only come from one place: the knowledge economy.

The knowledge economy is often the subject of misunderstanding and mistrust – both from policy makers and the general public – but its importance is an inescapable economic reality. The fact is that the things we buy, and the methods we use to make them, rely more and more on knowledge and technology, and less on manual labour. Unless we want to reverse our consumption habits and slash our wages, we cannot swim against the tide of the knowledge economy. Like any fundamental economic shift, the knowledge economy has caused disruption and uncertainty for many people, especially those without the higher-level skills that the knowledge economy demands. However, the solution to these problems does not lie in turning back the clock, but in turning the power of the knowledge economy to everyone's advantage. The challenge is to create a knowledge economy that provides jobs for everyone, both high-skilled and low-skilled, in all parts of the country.

The starting point for this is to return the UK to balanced prosperity, by focusing on the areas we are good at, and taking advantage of new economic trends. We need to base our model for economic growth around activities that unlock real value, not debt-fuelled consumption. We need to address the UK's long-term strategic trade gap, so that Britain can once again pay its way in the world. To achieve this, government must commit to sensible, long-term policies that support the future of our knowledge economy.

To this end, we have set out a vision of what a balanced and sustainable knowledge economy will look like in 2020. This paper presents this vision, while providing a comprehensive overview of the policies that are needed to get us there.

A handwritten signature in black ink, reading "Ian Brinkley". The signature is written in a cursive, flowing style with a long horizontal line extending from the end.

Ian Brinkley
Director

A vision of a prosperous 2020 knowledge economy

By 2020, the UK economy will have successfully recovered the output lost during the 2008/09 recession and will be experiencing sustained economic growth. Unemployment will have returned to pre-recession levels. This prosperity will have been driven by sustained growth in the UK's knowledge economy.

This vision builds on the results of our two-year Knowledge Economy 2 research programme to establish a possible future for our economy. This programme has studied how our economy is re-shaping towards more knowledge-intensive ways of working – towards activities which create value from exploiting knowledge rather than physical assets and manual labour. The analysis has looked forward to consider the potential for the continued development of these activities over the coming decade.

Realising this vision will depend on sustaining the trends of the previous 30 years – knowledge-intensive activities have driven job growth in the UK. Achieving this will depend on action to secure the fundamentals of our knowledge economy. By 2020 we will have:

- An economy where **productive entrepreneurship** can flourish, and our potential high growth firms are not held back by local conditions or systemic weaknesses in management and leadership skills;
- A world class pool of **knowledge workers** - driven by a sustained expansion in the graduate workforce, improvements will have been seen across all disciplines, but the quality of science, technology, engineering, and maths (STEM) graduates will have received particular attention;
- A strong reputation for commitment to **investment** in a world class science base as well as research and development, creativity and design; and
- A strong understanding of how to **make the most of our public services** – this will fully recognise their role within the knowledge economy, both as knowledge economy sectors in their own right and as anchor institutions at the heart of public private innovation ecosystems.

Four key knowledge economy sectors will have been prominent within this growth:

- **Low Carbon** – growing global demand for activities which reduce or mitigate against the release of carbon dioxide in the atmosphere will have successfully been translated into private demand for innovative new British manufactured goods and service offers.
- **Creative Industries** will have responded to pressures to develop new business models, maintaining their position as a major creator of expressive value for the whole economy, as well as significant employer and exporter;
- **Manu-services** – the majority of British manufacturers will have adapted to a new business model, in which they generate as much value from the innovative services they sell to their clients as from the goods they produce; and
- **Knowledge-based business services** – the UK will remain the world leader in business services, and will have a plethora of innovative companies that drive innovation and act as the infrastructure of the knowledge economy.

Set against the background of the worst recession in living memory, the Knowledge Economy 2 programme was developed to consider what a more balanced and sustainable knowledge-based economy would look like in 2020, back-cast to where we are today and establish what needs to be done to achieve this objective.

We now know that our economic boom was unsustainable – it relied too heavily on the growth of financial services, property and construction. It was fuelled by expanding public spending and a debt bubble. Today the British economy faces the challenge of recovering from the bursting of this bubble. Unemployment stands at a little under 2.5million. Despite encouraging signs in early 2010 the economy does not appear to be growing. Our public sector is facing the largest fiscal deficit in living memory. A recovery built on the old drivers of private sector debt or public sector borrowing is neither likely nor desirable.

Private consumption is being held back by our shaky labour market; the young and those over 50 are facing particular barriers. Consumer credit growth rates are still well below levels seen at any point in the past 15 years. Similarly, public spending is unlikely to be a key driver of jobs and growth, although public spending could be tuned to better support related private enterprise.

Recognising these tough times, many within and outside of politics have called for a rebalancing of the economy. This means moving away from a dependence on financial services and the public sector, away from a reliance on public and private debt, and away from a concentration of activity in London and the Greater South East. Responding to this debate two key questions have informed and driven the Knowledge Economy 2 research programme: Where are the jobs going to come from? And, how is the economy going to grow?

Our research shows that the knowledge economy is the only viable answer to these questions. This knowledge economy, founded on technological progress, advanced products and highly skilled workers, has driven economic growth for the last 40 years, and must continue to do so if we are to succeed. It remains the only sustainable way for the UK to create value within an increasingly competitive global economy. But this success can only be achieved if we put in place the right policies to provide a platform for the continued development of our knowledge industries.

The knowledge economy is often misrepresented as favouring services over manufacturing, as destroying jobs, as creating money from thin air. All of these misconceptions are wrong; in fact, the knowledge economy is as much about manufacturing as services, and is the most productive and valuable part of our economy.

At its heart, the knowledge economy refers to activities which create value from exploiting knowledge and technology rather than physical assets and manual labour. It has grown because we now buy different types of products and services, and because the methods involved in making them have changed. New technologies and business processes may have destroyed some jobs, but they have also created new, highly skilled jobs in managing and applying these knowledge-based assets. The Work Foundation's first Knowledge Economy Programme focused and developed our understanding of this change.

Our previous research explored the foundations of these activities. It concluded that the rise of knowledge work is being advanced by three significant changes in the ways in which economies work and how organisations operate within them:

- The rise of knowledge and technology intensive jobs and economic activity;
- Investment in knowledge-based assets or 'intangibles' outstripping investment in the physical; and
- Increasingly well qualified and educated workforces.

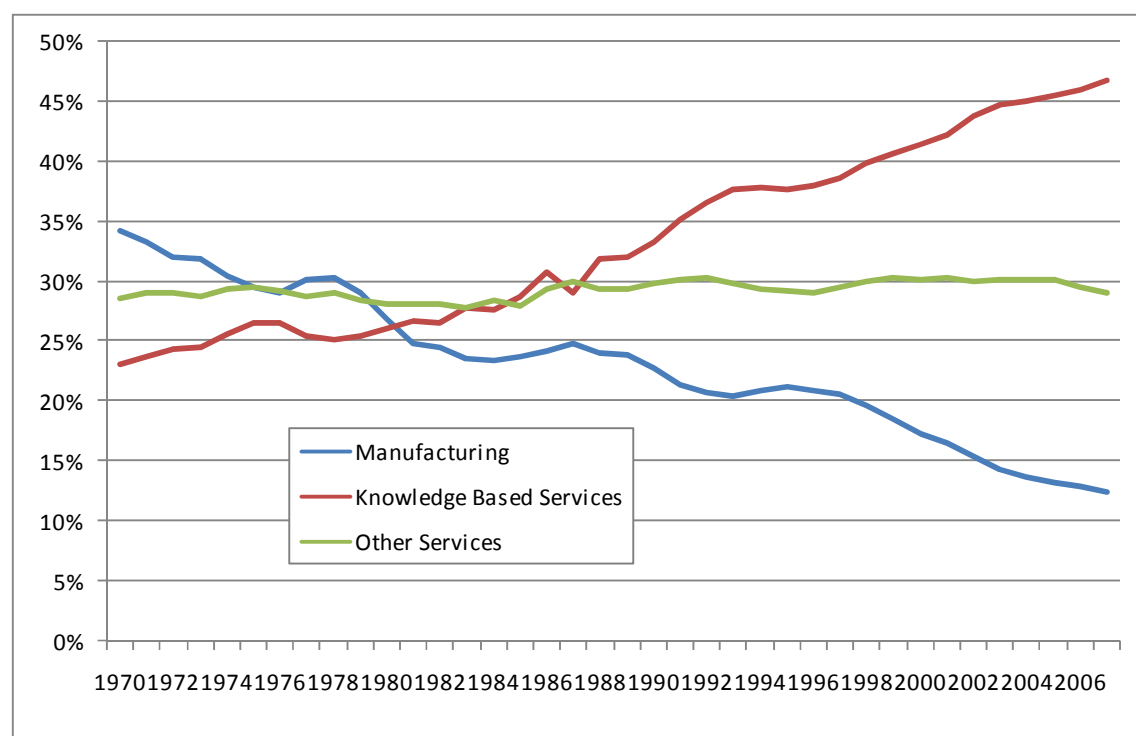
Taken together, and seen across all industrialised nations, the changes have both driven and reflected the growth of the knowledge economy. These drivers reflect a fundamental, and almost certainly irreversible, shift in how advanced nations create value. It is these knowledge-intensive activities which we must now support if we are to achieve a sustainable and balanced recovery.

The research programme has developed this vision for what a sustainable knowledge economy could look like in 2020 through the production of close to 20 reports and an extensive calendar of events. Further details of the key outputs from the programme can be found within the Annex, available as a separate document. The remainder of this report reflects the breadth of this work and sets out our vision for a positive future for the knowledge economy, identifying the key actions needed if we are to realise such an appealing scenario.

The potential of the knowledge economy

In times as tough as today, it is easy to lose sight of what has driven sustainable growth in our economy. The chart below however, illustrates how in the past thirty years value in the UK economy has restructured towards knowledge-based services. The knowledge economy has also become central to how the UK pays its way in the global economy – between 1987 and 2006, the value of the UK's knowledge-based service exports grew from less than £13 billion to just under £90 billion. We not only use knowledge to power our own industries, we sell it to the world.

Economy restructures towards knowledge-based services (GVA, 1970-2007)

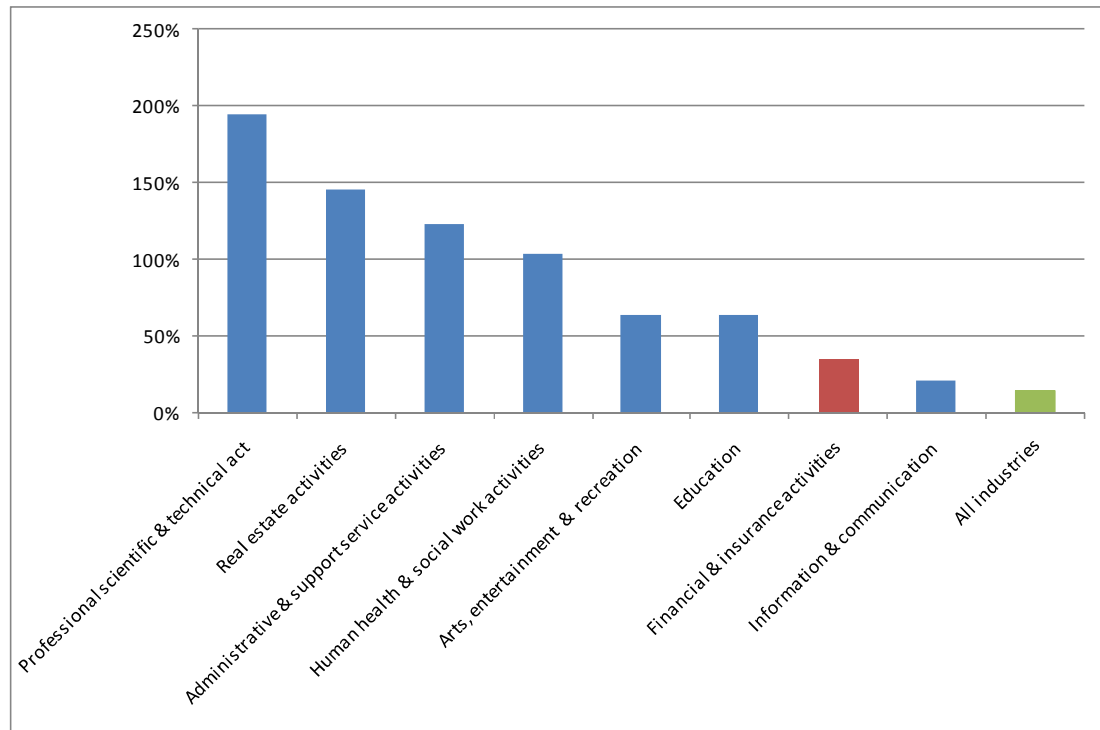


Source: EU KLEMS Database

Note: Knowledge-based services based on OECD definitions includes communications, financial services, business services, education and health. All other services include retail, hospitality, transport, public administration and other community, social and personal services. Manufacturing includes both knowledge-based and other sectors

This shift has also been reflected in the jobs we do; between 1979 and 2010, employment in knowledge-intensive market-based services increased by 93 per cent and employment in more public-based services such as education and healthcare increased by 89 per cent. In contrast, employment across the economy went up by only 13 per cent. This means that our knowledge economy has created more than 7 million net new jobs in the past thirty years.

Employment Growth in Knowledge-intensive Service 1979 - 2010



Source: ONS Workforce Jobs

This change in jobs and value has been matched by an equally profound and large scale change in business investment. Business investment has moved away from 'old economy' tangible assets of machines, buildings and office hardware, towards 'intangible', knowledge-based investments including R&D, software, design and development, and human and organisational capital.

Knowledge Work and Knowledge Workers

Knowledge-intensive work can be most easily thought of as activities which depend on the use of high-level 'tacit' knowledge that resides in people's minds. This tacit knowledge takes the form of expertise and/ or experience, rather than being written down (or codified) in manuals, guides, lists and procedures. Examples of knowledge-intensive tasks include bespoke statistical analysis, system maintenance, graphic design or software design.

Our knowledge worker survey (conducted under the previous knowledge economy programme) broke down our workforce into three groups – thirty per cent are in jobs with high knowledge content, 40 per cent are in jobs with some knowledge content, and 40 per cent are in jobs with less knowledge content.

Reference point: *Knowledge workers and knowledge work* (2008)

The potential of the knowledge economy

We can have confidence that progress towards the global knowledge economy will not be reversed. Change has been underpinned by three fundamental drivers:

- **Consumer demands are changing** – as consumers become richer, more sophisticated and more diverse, they increasingly buy intellectual content and technologically advanced products and services. This is driving up the demand for knowledge-intensive products and services;
- **Technological progress** – the development of new technologies both increases productivity and creates new products and jobs; in particular, the proliferation of powerful cheap computing power and the internet has made many knowledge-intensive ways of working possible; and
- **Globalisation** – increasing flows of ideas, knowledge and goods from around the world have accelerated the transition towards a knowledge economy.

These trends are unlikely to be reversed in the foreseeable future, and their implications are universal – they affect all industrial sectors, all sizes of firms, the public sector as much as the private sector. The knowledge economy is clearly here to stay. The question for policymakers is not whether to embrace or reject the knowledge economy, but how to best support change within our economy as it continues to respond to the knowledge economy.

It is fortunate therefore that the UK has considerable strengths here, and on almost every measure ranks amongst the leading knowledge economy nations:

- By international standards our workforce is highly concentrated in what we would think of as knowledge-intensive occupations – at 43 per cent this is ahead of our main European rivals, but behind a number of leading Nordic countries;
- Our economy is highly concentrated in knowledge-intensive industries – in terms of employment, at 52 per cent we are just behind Sweden and Denmark and just ahead of the US. By GVA, at 47 per cent, we are very close to the core group of leading nations;
- The latest World Bank Knowledge Economy index ranks the UK 9th highest – behind only Denmark, Sweden, Finland, Netherlands, Norway and Canada; and
- Perhaps most importantly, and most positively, we pay our way in the world through the delivery of knowledge services - per capita in 2008 we exported more knowledge services than any of our major competitors.

The information highlighted here is supplemented by a technical annex setting out the key knowledge economy facts and figures and how we compare against other leading OECD economies.

It was these knowledge-intensive services which drove our recovery from the last two recessions – this was true in the UK, across the EU15 and in the United States (*Recovery and Recession*, 2009). We should have faith in the potential of the knowledge economy to drive our recovery again. But, as we outline below, there are serious obstacles to be overcome if we are to achieve this sustained growth. An additional concern, explored in the box below, is the way in which the benefits from the knowledge economy will accrue across the country.

No City Left Behind?

Knowledge Economy 2 has worked with its sister programme, Cities 2020, to consider the spatial implications of the knowledge economy. Our research confirmed that the knowledge-based economy is largely an urban phenomenon: in 2007, 27 per cent of employment in private knowledge-intensive services in Great Britain was concentrated in London, while a further 20 per cent was found in the twelve largest cities.

For many knowledge-based activities cities provide ideal locations. The productivity advantage of cities is underpinned by the benefits sharing, matching and learning. Sharing of costly infrastructure, ranging from buildings to niche restaurants, reduces costs. In an increasingly specialised economy, urban scale allows firms to match their needs to a wider variety of suppliers. And, crucially in the knowledge economy, proximity allows urban firms, entrepreneurs and workers to learn from each other – with exchanges of knowledge enabling innovation and increasing productivity. These powerful forces of agglomeration provide incentives for knowledge-based firms to cluster together.

Yet while the knowledge economy is urban, we found little evidence that the dominance of cities was increasing. London's share of national employment in private knowledge services actually fell slightly between 1998 and 2007. Amongst the twelve largest other cities the majority saw modest increases in their share of national private knowledge employment. The largest proportionate increases were seen in areas away from major towns or cities, although this growth was often from a very low base.

The knowledge economy remains vital to economic growth in cities. However, knowledge-intensive activity is unevenly distributed between cities. This will have implications for the geography of the recovery, an issue we investigated in our publication *No City Left Behind?* in July 2010. We developed an index of growth potential – based on availability of highly skilled populations, the reliance of a city on the public sector and high levels of employment in the knowledge-based industries which are likely to drive the recovery.

Cities such as Cambridge, London and Reading were economically successful and have high growth potential; others such as Grimsby, Barnsley and Hull had experienced little of the boom running up to 2007, had a difficult time in the recession and had low potential for growth in the recovery. A lack of funding to address regional disparities, and the entrenched difficulties faced by these cities suggests that the government will have a difficult time meeting its goal to rebalance the economy.

Reference points: *Flat or Spiky: The changing location of the British Knowledge Economy* (April 2010). *No City Left Behind* (December 2010)

The foundations of our future knowledge economy

As set out above, the knowledge economy represents a fundamental change in how our economy creates value. There is no other option; in laying the foundations for future growth, economic policy must ensure the presence of conditions in which our knowledge economy can flourish.

The government has a central role to play in helping the UK achieve this vision of a balanced 2020 knowledge economy. The growth of the knowledge economy has expanded the role of the state in the economy, as it has made many types of market failure more acute. Today's economy is far more complex – the greater role of knowledge and trades in knowledge is associated with a shift from simple transactions to much deeper integration and complex interaction between organisations. The intangible assets that are the key commodity of the knowledge economy are inherently hard to trade and to value accurately. This leads to a range of competition issues and market failures, and demands new frameworks and platforms from both the private and public sectors. Politicians can debate the extent to which the government should be involved in the economy, but its involvement in many areas of the knowledge economy is simply a fact of life.

The government has made a number of important commitments to the knowledge economy, but it has also been caught looking both ways. The government is talking sensibly about the knowledge economy, the importance of high growth firms and the importance of innovation. The 2011 Budget and the accompanying Plan for Growth show the willingness of the coalition government to think broadly and imaginatively about how to drive growth in our economy. Particularly welcome was provision for expansion in the Enterprise Investment Scheme, the increased R&D tax credit for SMEs, the Entrepreneur's tax relief and £100 million additional resources for science. However, building a successful knowledge economy will demand commitment on a much greater scale.

Disappointingly, some of the government's most expensive policies have been based on an outdated view of the UK economy:

- **Corporation tax cut** – The large cut in corporation tax will cost the Exchequer over £5 billion a year by 2015/16, but only marginally changes the incentives for firms to invest and drive growth;
- **National Insurance holiday** – Reflects a simplistic attempt to re-balance the economy and create new firms outside of the economy. Fortunately, its poor take-up has avoided the bulk of its planned £940 million cost;
- **Enterprise Zones** – The government's flagship regional development policy ignores the reality of which activities have the potential to drive sustainable growth, yet £200 million has been allocated here; and
- Perhaps most worryingly the government has demonstrated a limited understanding of its role within the economy – reform is ignoring the reality of **how our public services support innovation** within our economy.

The Chancellor could have done far more for the knowledge economy had he avoided some of these expensive policies. This measured support for the knowledge economy contrasts poorly with the actions of many other developed nations. Many of our major competitors chose to invest heavily in their knowledge economy in response to the recession. Canada's

The foundations of our future knowledge economy

stimulus plan (known as the Economic Action Plan) provides close to £4 billion of additional spending on higher education and science. The US Economic Stimulus plan included a US\$ 9 billion investment in R&D, as well as US\$80.5 billion investment in education, although some of this funding has recently been cut. Universities UK have also identified significant increases in higher education investment in France and Germany.

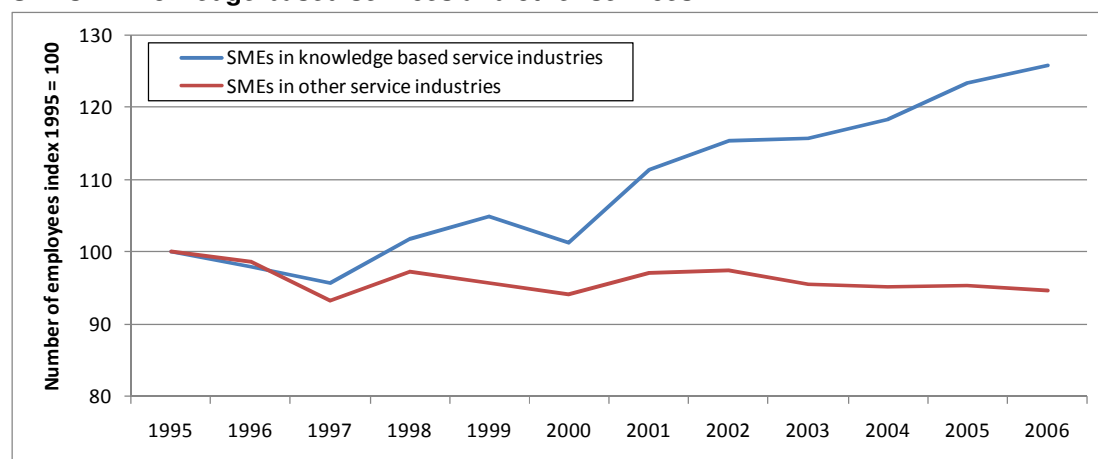
At a time when many of our trading rivals are throwing their weight behind their knowledge economies and funding substantial investments we should be fully committed to this agenda. We should do what we can to ensure our businesses have what they need to secure our advantage in the knowledge economy. However, we appear to be only dipping our toe in the water. Our research has identified clear and urgent areas for priority action:

**An
enterprise
policy that
works for
high growth
firms**

Evidence suggests that the majority of new jobs will be created by a small number of rapidly growing firms. Unfortunately, the desire to support potential high growth firms has been poorly translated into an actionable policy agenda. High growth firms are still particularly likely to face obstacles in areas which are regarded as the 'basics' of economic development, and many small, potential high growth firms demonstrate a need for special support to develop management and leadership skills.

We know that a tiny minority of dynamic high growth firms are disproportionately responsible for the majority of job creation within the private sector, and small enterprises appear to be critical to the performance of our knowledge economy – as the chart below illustrates, SMEs in knowledge-intensive industries appear to be of growing importance. Ensuring that firms with the potential to be high growth can achieve will be absolutely central to achieving a lasting and sustainable recovery.

SMEs in knowledge-based services and other services



Source: BERR, Work Foundation Estimates

The available evidence suggests however, that while the UK performs strongly on start-up rates, more sophisticated indicators of entrepreneurship paint a mixed picture. It seems that we have high start-up rates, but growth may be weaker. Yet, in recent years public policy has

focused on giving small sums of money and support to a large number of businesses – this is typically very far from the type of engagement that could potentially make or break the business plan for a firm with the potential for high growth.

While there is now a consensus that these high growth firms are crucial to recovery, little has been said about what should be done to help them grow. The challenge is that we can say almost nothing of use about the distinguishing features of high growth firms – they appear to make up a fraction of firms of all ages, of all sizes and exist in all sectors and all locations regardless of wider performance. Research has to date largely failed to identify and study the enterprises which have the potential for high growth, but for whatever reason fail to achieve.

Drawing on interviews with entrepreneurs from current and potential high growth firms, our research set out to address this major policy gap. We identified that the performance of these firms strongly depends on their local environment – the basics of economic development are even more important for firms experiencing high growth. This means ensuring access to finance, skills and a planning system that ensures that high growth firms can easily find the space they need to expand.

For many high growth firms an additional area of support is necessary. The skills required to develop a new innovation, create a business model or start a new firm are very different from those required to bring a new product to market or to diversify an existing firm, and markets fail to necessarily put the best leaders at the head of our most important growing businesses. There is an important role for government in addressing the leadership and management problems faced by high growth firms.

The first year of the Coalition government has seen dramatic changes in the business support landscape. The focus has been on light-touch initiatives broadly aimed at information provision and encouraging micro-level start-ups – the scaling back of Business Link activities to a website and call centre portal, the introduction of a New Enterprise Allowance (amounting to approximately £2,000 per small firm assisted), targeted action to increase business start-ups amongst ethnic minorities and women and the “StartUp Britain” campaign are all examples of this.

A number of initiatives have been introduced to support the growth of existing businesses: Business Mentor schemes show real promise, Business Coaching for Growth has the potential to help firms reach new levels, the commitment to maintain the Manufacturing Advisory Service will allow an effective organisation to continue and some monies from the Regional Growth Fund will be allocated in this area. However, these funds will be modest in comparison to those dispensed by the now axed Regional Development Agencies.

Despite the rationalisation, business support in the UK remains messy, reliant on occasional funding and focused on providing a small amount of support for a large number of firms. Business support needs to be refocused on high growth firms. This must operate successfully at a local level, yet at present local authorities and sub-national bodies have little funding to drive this important agenda.

Published ahead of the March 2011 budget, our paper *Ready, Steady, Grow?* set out two clear asks:

- Action to support the delivery the basic local conditions in which high growth firms can flourish across the country, by ensuring that LEPs develop as effective strategic and practical bodies, with the power and capacity to act as a link between local enterprise and public policy; and
- The creation of a Local Enterprise Leadership fund to develop local business leadership. These must be designed and developed using local expertise to complement and build on nationally procured schemes. Local Enterprise Partnerships, in tandem with institutions such as business schools and local chambers of commerce or other business representatives, should bid for a central fund to develop local institutions that focus on leadership. Finding finance for this fund would also be an opportunity to rationalise the existing, confused system of business support.

The Chancellor's commitment to the reform of the planning system, a stronger package of financial support for SMEs and an expanded Entrepreneurs' Tax relief was welcome, but the high profile extra cut in corporation tax and the flagship introduction of Enterprise Zones are marginal changes that will do little for potential high growth firms - the business cases of potential high growth firms are not made or broken by small (but expensive) tweaks such as these. Overall, the Chancellor missed a key opportunity to deliver on what high growth firms of the future urgently need today.

Reference point: *Ready, Steady, Grow? How the government can support the development of more high growth firms* (March 2011)

A skills agenda that will deliver the workforce needed by our future knowledge economy

This will depend on establishing a funding mechanism for higher education which can sustain the recent expansion in provision. This will be needed as demands for graduate skills will continue to expand in line with the development of the knowledge economy. Action to improve the quality of graduate skills and to better match these to the needs of employers must also be accelerated.

Delivering enough graduates for the knowledge economy

The rise of knowledge work is creating renewed demands for high level skills within our economy. While recent graduates are suffering in today's labour market, the evidence shows that our economy is successfully adapting to exploit expanded graduate supply. Graduates are maintaining their earnings premium over those with secondary education, and the proportion of graduates entering what can be thought of as graduate occupations has held steady – neither of these would be the case if we had a long-term oversupply of graduate skills.

The reason for this surprising result is that higher education is an excellent training ground for the knowledge economy – a degree reflects an ability to use tacit knowledge to assimilate, interpret and use a range of specialist information to achieve desired objectives. For most graduates, the detail of the subjects learnt at university is of little practical relevance to their future professions – very few of last year's 25,000 historical and philosophical studies will now be using the detailed information learnt in their studies. However, it is the knowledge of how to process, synthesise and communicate information developed in the pursuit of these that is of future value. These capacities are central to the

notion of knowledge-based work set out above – they relate to the ability to develop and use knowledge.

These skills are therefore central to the continued development of the knowledge economy. Rather than eroding the value of a degree, the expansion in graduate supply has been fuelling our growth. Sustaining this expansion will be a prerequisite of further growth within our knowledge economy – it should be seen as a worry that in 2008 14 countries were educating a greater proportion of their populations to a degree level than the UK, especially since we ranked third on this measure in 2000 (Source: OECD Education at a Glance).

In our paper *Shaping up for Innovation* we argued that, given the government's broad fiscal commitment, the Coalition has been left with little option but to allow an increase in tuition fees. This increase has now been announced, but implementation has been far from smooth. It now looks likely that fees will rise higher than expected, as will the public costs associated with the student loan book. It is absolutely vital for the future success of our economy that we use these reforms as an opportunity to put in place a higher education funding system that can sustain a future expansion in higher education provision. This will demand a substantial commitment of future resource.

Delivering the right graduates for the knowledge economy

Unfortunately, simply producing more graduates will not be enough to secure the future workforce we need. It is essential that our higher education institutions deliver the right graduates with the qualities needed by employers and with the capacity to drive forward innovation. Yet, to date, public policy has failed to set out a clear narrative on what constitutes an economically valuable degree.

This is often seen as a battle between different subjects, based either on the earnings premiums or on demand forecasts. Unfortunately these premiums are often either short term and self-correcting, or a result of systemic issues rather than genuine need and there are real limitations to how well we can predict specific skills demands – we can not predict technological change or the consumer preferences on which these depend.

In recent years there has been a particular interest in increasing the number of science, technology, engineering and maths (STEM) graduates, but as set out below, while there are clear issues with STEM, it is not clear that this is always an under supplied or necessarily a more important group of disciplines for the future of our economy.

The role of STEM skills in driving innovation in the 2020 knowledge economy

Invention can be thought of as comprising two parts – a new idea and the technical process of scaling and packaging this new knowledge to create a viable product or service. While it is hard to associate skills with new knowledge creation, technical expertise (supported by STEM skills) is clearly of relevance for the process of development.

It is worrying then, that many employers report shortages of these skills. However, the response in recent years of simply funding more STEM places reflects a partial understanding of what is a very complex issue. Reported shortages are puzzling when we are educating quite so many young people in this area. By international standards we now

have a very high proportion of science graduates amongst our 25-34 year-old labour force, and substantial recent increases do not appear to have alleviated the issue.

Our analysis showed that this situation relates to the operation of demand for STEM graduates rather than the volume of supply. It seems that higher education institutions are in aggregate not producing the quality of graduates demanded by employers (a topic explored in more detail within our full report), and graduates do not perceive STEM careers to be attractive – for every two STEM graduates in the labour market, only one is in a STEM related occupation, despite the wage premium for STEM graduate who pursue STEM occupations.

But there are real limitations to how far we should prioritise STEM skills as a driver of innovation. Their relationship to invention is undeniable, but this reflects only a portion of innovation processes – a broad range of skills can be identified as important here. For example:

- **Design skills** – The Cox Review defined design as shaping ‘ideas to become practical and attractive propositions for users or customers’. This is of clear relevance for innovation since these are the key skills through which new knowledge can be translated into a form where it is of maximum value to businesses and consumers;
- **Commercial skills** – innovation depends on understanding how products will sit within and lead the development of new markets, the understanding how business and markets operate will be of particular relevance; and
- **Communication skills** – The ability to transmit information, thoughts or opinions is of clear relevance for all aspects of innovation – humanities courses that have an explicit focus on communication, may therefore be of great relevance for supporting innovation.

One response to the apparent breadth of skills needed for innovation might be to mandate that degrees should be broader in content – spanning aspects of all of these skills. While this is very likely to be the case for many courses (STEM in particular), it is far from clear that on aggregate this would drive innovation – broadening courses will almost certainly result in students diving less deeply into individual areas of content.

The fundamental question here is – do we need innovators who have mastered the full breadth of these innovation skills (the true renaissance man) or stronger and supportive co-operation and relationships between individuals and organisations within society (a renaissance society). It seems highly unlikely that there is a single answer to this question. A balance would be very difficult to prescribe since it would depend on individual personal characteristics. The challenge for policy must be to construct a system in which individuals can develop deep knowledge of a range of areas, but are able to communicate and share their knowledge effectively.

Given the real limitations we face in picking and identifying degrees for the future, the focus for policy should instead be on improving the quality of our education offer. Evidence suggests that stronger industry and entrepreneurial skills are key areas for improvement, and can only be developed through strong relationships between employers and higher

education institutions being developed across the sector. As noted above, STEM courses appear to be a particular weakness and should be a priority area for action.

Delivering this change will depend on universities (and perhaps more critically the academics who develop and deliver courses) being incentivised and supported here. The Coalition's commitment to transparency and performance metrics for universities is welcome, but the failure to strengthen competition on teaching through the introduction of a variable fee regime (most universities are expected to charge the full £9,000) is a concern. Recent proposals to exempt the 65,000 most able students and a further 20,000 selected places from the cap are only a partial solution. This arrangement would be unlikely to drive performance in many of our higher education institutions.

Connecting our knowledge economy to global skills pools

The rise of our knowledge economy has only been possible because companies have had access to the right skills at the right time for the right price. In a similar way to which manufacturers have prospered by reducing stocks through 'just in time' supply chain management, an ability to access global talent has allowed companies based in the UK to operate very efficient and flexible just in time skills strategies. The immigration of high skilled workers is also an important route through which knowledge enters our economy, supporting innovation and driving forwards our knowledge economy.

We cannot rely on our higher education system to fill all of our skills needs. Migration of highly skilled labour will need to continue to support the knowledge economy and particularly to fill gaps in areas where we have short term demands or deficits in correcting long term supply issues – any attempts here would be very inefficient. High-level skills require time to develop and therefore unexpected demand cannot be met immediately through the UK's training and development mechanisms.

Furthermore, focusing too heavily on the role of domestic talent for our future growth risks viewing knowledge workers as a commodity that can be measured in aggregate and supplied on mass. Many high skill immigrants are employed because of highly individual and personal characteristics. We need an immigration policy that helps us to best exploit global expertise to drive value creation within the UK.

Policy in this area is highly contentious and evolving rapidly. While the Prime Minister and Home Secretary have a stated aim to dramatically reduce net immigration, and a cap is now in place on the number of high skilled immigrants entering the UK each month, there are some indications that policymakers are understanding the importance of this agenda.

The detail of current policy here is perhaps less significant than its presentation, and how this enshrines confidence in investors that they will in the future have access to the staff they need. We urgently need some form of long term commitment from the Coalition Government that they are working to put in place policies to ensure the long-term sustained expansion of our higher education system, that will act effectively to drive quality and that investors will have access to the skills that the enterprises they back need in the future.

Reference points: *Shaping up for innovation: Are we delivering the right skills for the 2020 knowledge economy?* (September 2010) *Simply the Best: High Skill Migrants and the Knowledge Economy* (Summer 2011)

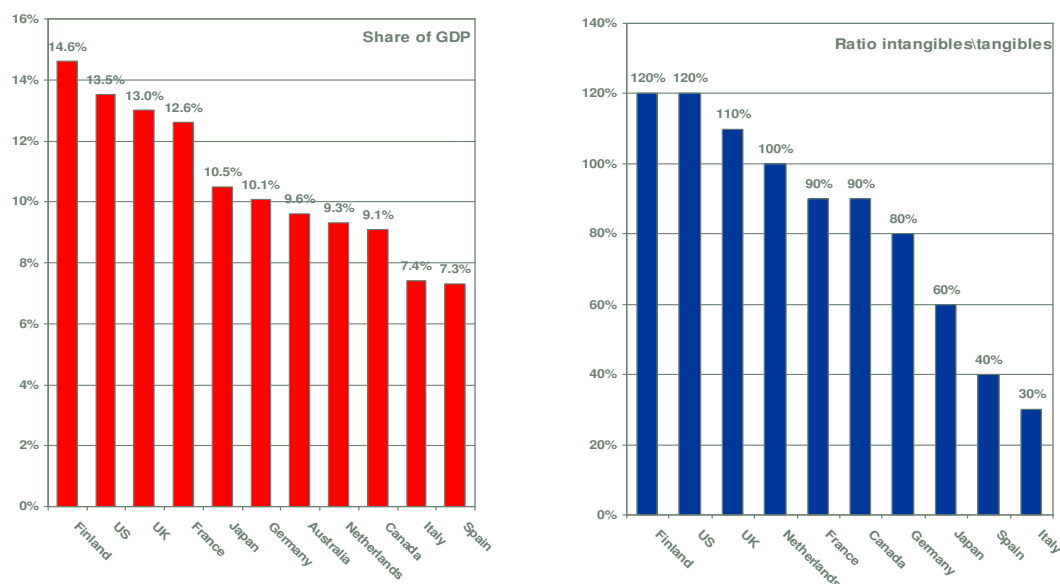
Sustaining our scientific and research leadership

At the heart of a high-performing UK knowledge economy in 2020 are the decisions and commitment we take today to sustain our scientific and research leadership. Investment in intangible assets – including R&D, software and brand equity – is the key source of lasting growth in the knowledge economy. If we fail to sustain our investment in these intangible assets, we are unlikely to sustain our economic growth. This investment comes from both the private and the public sector; both universities and businesses are crucial in expanding the UK's knowledge base. Whilst the UK's research output is high by international standards, we could do more to capitalise on the value of our best institutions. Any credible plan for the 2020 knowledge economy must strengthen the UK's research base whilst radically improving our networks for turning research into commercial opportunities.

Supporting business investment in the knowledge economy

Britain's businesses invest significantly in intangible assets; this is one of the key signs that we have a strong knowledge economy. Private sector investment in intangible assets stood at £140 billion in 2008 - almost £40 billion more than investment in tangible assets (BIS 2010). This makes the UK one of the world's biggest investors in intangible assets, as the figure below shows:

Investment in intangible assets in selected OECD countries



Note: All figures share of market sector GDP. Finland excludes financial sector, US excludes farming. US average 1998-2000; Germany, France, Italy, Spain are 2004 Japan average of 2000-2005; Netherlands and Canada 2005. These comparative figures date to 2004 for the UK. The ratio of intangible to tangible investment has since increased.

Among this investment in intangible assets, the UK is relatively weak on R&D spending. R&D investment by UK businesses stands at just over 1 per cent of GDP, compared with over 2 per cent in Japan and the USA, and behind France and Germany (BIS 2008). The government has taken steps to address this, partly through proposal to expand R&D tax credits, a positive statement of intent. However, a recent Treasury review (HMRC, *An*

Evaluation of Research and Development Tax Credits, 2010) warned that, while the current credit scheme is widely applied by accountants to cut tax liabilities, the break has limited impact on those who actually take business decisions on investment. Any expansion in the scheme must only be implemented if ways to address this fundamental issue can be found.

R&D spending only covers a relatively narrow range of innovative activities. The 'Patent Box' policy could help to overcome this by establishing a framework through which companies can claim lower rates of tax on profits derived from patents. Since patents are by definition innovative, this acts as a tax break for innovative firms. Unfortunately, this policy still does not capture the whole range of business investment in innovation. In particular, the proposed Patent Box scheme will exclude revenues generated from copyright, which means that this will have little effect on the creative industries. The government have decided this to focus on high-tech R&D and manufacturing activities, but this represents an outdated view that these activities are the only sources of innovation. Although important, these activities actually represent a relatively small share of the UK knowledge economy – it is this fact that explains why the UK has such a low level of investment in R&D despite high spending on other forms of intangible assets.

This oversight increases the importance of reforms to ensure our intellectual property rights (IPR) system creates an environment that is supportive of investment in a broad range of intangible assets. We recommend that the Government take a fresh approach to restructuring IPR law to keep pace with changing forms of expression and expressive value. Adopting the Hargreaves Review proposal of an 'exceptions' approach to copyright would be an important step in the right direction. This will help to build a system flexible enough to ensure users can work creatively with existing copyright works, while benefits still flow to the original content owners and wider society – even if this expedient solution does fall short of establishing perfectly clear 'rights' for users. Proposals such as the central Digital Copyright Exchange should also be welcomed.

The role of universities and public research organisations in a knowledge economy

As well as business investment, universities are also a key contributor to the research base. The UK has world class universities which are at the heart of our knowledge economy. In addition to their education role, they support our economy directly:

- As global leaders in research many of our institutions create value by extending the boundaries of our knowledge;
- Many universities excel in conducting applied research to solve practical and often technical business challenges; and
- Many connect directly with their local economies by cultivating relationships with local businesses.

All three of these routes are important for the knowledge generation and transfer relationships that fuel our knowledge economy, and we need a funding system that supports development across our higher education institutions.

Ahead of the 2010 Spending Review we called for the government to protect public funding for science and research. We therefore applaud the Government's recognition of their crucial role in scientific leadership, as signified by the relative protection of funding for scientific

research, and the £100 million added to the science budget in 2011-2012. This injection has come at an important time when our universities and PROs are facing ever-increasing international competition and financial pressures.

There are good links between UK firms and the UK's broader research base – the old adage of academics in ivory towers is no longer appropriate and universities transfer knowledge through a variety of (both well and poorly measured) mechanisms. But capitalising on these opportunities will require the continued development of a suitable network of intermediaries. In August last year we set out a list of principles that could be taken from the German Fraunhofer Institutes to strengthen the UK Innovation Eco-System. We therefore very much welcome the announcement of a £200 million commitment to a network of Technology Innovation Centres in the 2010 Spending Review.

Technology Innovation Centres (TICs) represent a great opportunity to strengthen both our businesses and our universities. The Government and the Technology Strategy Board must be bold in the implementation of TICs and hold no bars in building a world-renowned brand and reputation akin the Fraunhofer network in Germany. We urge that TICs should reflect our knowledge economy strengths – as laid below – and dedicate one of this network exclusively to the Digital and Creative Industries. The Government must recognise that TICs cannot operate in a vacuum and that their real impact will come from driving an understanding of how to connect to private industry throughout our HEI sector. Helping businesses to learn how to draw knowledge from across our HEI sector can be bolstered by a 'round door policy' across academia, business and TICs. Policy levers such as subsidised secondments from business into TICs will be crucial in making sure the flow of human capital reaches right across the innovation ecosystem.

Though important, building TICs alone will not be enough to ensure that we make the most of our higher education institutions. It is absolutely vital that the forthcoming Innovation Strategy sets out a clear vision for a future funding system that supports the full range of ways in which our higher education system engages with our knowledge economy – fundamental research, application and building relationships that support local businesses.

Reference points: Innovation, creativity and entrepreneurship in 2020 (March 2010), Technology Innovation Centres: Applying the Fraunhofer model to create an effective Innovation Ecosystem in the UK (December 2010), The role of higher education institutions in a knowledge economy (Summer 2011)

Making the most of our public services

The public sector connects to the knowledge economy directly through its dominance of knowledge-intensive areas of activity – healthcare and education in particular – and indirectly through its procurement budgets. Yet, there appears to be considerable room for improvement in how the public sector manages its own intangible assets, and in how it connects to and supports innovation within the private sector.

Public sector activities connect directly to the wider economy in far more than financial ways. In the past, The Work Foundation has illustrated the breadth of ways in which the public sector can help to drive forward the knowledge-based economy. Public procurement can encourage innovation and acceptance of the new as well as the development of innovative new technologies and products. Publically supported educational, creative and cultural

institutions such as museums, art galleries, libraries, design and art schools and the BBC play a major role in the knowledge economy through the creation of expressive value and their position as knowledge hubs. Public institutions play an important role in meeting the regeneration challenge through developing the knowledge-based economy at city and city-region level. Finally, higher education institutions directly drive the export of knowledge services and increase the UK's world standing and reputation as a leading knowledge economy.

We are currently asking a huge amount of our public sector – services are facing a triple lock of shrinking public spending, expanding service demands and a broad reform agenda. In this context, focusing on investment in public service innovation and how to connect to and boost our fragile economy should be more important than ever. Yet, it appears that as the pressures mount, other priorities are driving the direction of public service reform.

In the international education sector there are significant limitations in terms of how well we are exploiting our existing strong public sector intangible asset base. The UK is the second largest destination for international students, and a global leader in Transnational Education (the delivery of educational programmes outside of an institutions home country). This activity should be thought of (and supported) as a successful, highly knowledge-intensive export sector; one which is dominated and driven by the exploitation of public sector intangible assets. Despite continuing efforts to market our offer, recent government action on visa arrangements threatens to undermine this work.

Similarly, the debate on NHS reform has been very narrowly focused – changing lines of accountability, competition and the marketisation of service delivery have dominated. Yet our research identified that the NHS struggles to successfully exploit its position as an anchor institution within our wider healthcare sector, offering limited support for the development of innovative products and services within its supply chain.

If the NHS fails to demand and purchase innovative new products and services then this will represent a major block on the healthcare innovation system. There will be less incentive for suppliers to invest in better understanding the needs of the NHS. Suppliers may be less willing to fund research into meeting these needs, or perhaps would be more wary of forming risky joint ventures to develop products and services which exploit new insights into care approaches. Ultimately the procurement signals sent out from the NHS will impact on its ability to deliver better or more cost effective goods and services. Reform should instead have focused on how to build and strengthen the intermediary institutions which will together support innovation. Unfortunately while the future of the NHS has been being debated, much of this infrastructure has been the subject of cuts.

Public sector work is highly knowledge-intensive – compared to private industry, public sector employment is characterised by a greater share of employment in knowledge-intensive services, a larger share of the workforce qualified to degree level, a larger share of the workforce is employed in the three most knowledge-intensive occupations, and a higher percentage of workers describe their work as including at least some knowledge-intensive tasks. The public sector is also a colossal investor in the intangible assets that we know drive performance in a knowledge economy – our analysis suggests that this investment totals as much as £50 billion annually.

With this in mind our public services must be viewed and supported as part of the knowledge economy. Only with this understanding can the government ensure public funds are being invested in ways that best drive innovation and boost performance across the public and private economy. In the face of mounting challenges for public services, it is critical that we continue to priorities support for the public-private innovation ecosystems that lie at the heart of our knowledge economy.

Making the most of our public sector will depend on further reforms being based on three key challenges:

- Public services need to develop a better understanding of how they invest in innovation – central guidance on valuing and managing investments in intangible assets would aid this;
- Public services must learn from private sector best practice of how to support and nurture ecosystems capable of driving innovation across many organisations; and
- Public services should focus on fostering new types of relationships with private sector partners – a shift from adversarial engagements towards more collaborative arrangements would better support the co-development of innovative new products and services as well as the easier transfer of best practice.

Reference point: *Making the most of public services: A systems approach to public innovation* (May 2011)

The importance of a knowledge economy strategy

In addition to identifying broad areas for strategic action, the programme has conducted a number of in-depth studies of particular areas of knowledge-based activity. Each show strong potential for growth, but also highlight the importance of some form of public leadership to remove barriers to success:

Maximising the potential of the Low Carbon Economy

Maximising the potential of the Low Carbon Economy will demand the translation of what are currently long term commitments on climate change into frameworks which can support long term investment in low carbon infrastructures, in the skills for the low carbon economy and in businesses seeking to create value from this changing demand. The successful implementation of a minimum price for carbon and a simplification of current support arrangements will be central to this goal.

A number of studies have demonstrated the job creation potential of responding to the low carbon agenda. These activities appear to fall into two groups:

1. The first group of activities relates to the **implementation of existing low carbon technologies** and processes to reduce carbon dioxide emissions – creating jobs by directly cutting emissions from the power sector, our homes, workplaces and transport systems.

These activities have the potential for significant employment generation; especially since the construction activities (which dominate this group) are highly labour intensive. However these jobs will tend to be strongly biased towards low skill activities. Also, it is unclear whether many of these activities will represent additional net employment creation and may actually displace employment in more carbon intensive areas.

2. The second group relates to the **manufacturing and service activities** which have the potential to create growth through innovation; they add value by creating products and services which meet demands from this agenda in new ways. Examples of British strengths would be the development of new energy efficient aero engines or innovative financial services which support the transition to low carbon ways of working – all of which have potential to anchor low carbon economy activity here, and will tend to be highly knowledge-intensive.

Manufacturing strengths here would build on current UK strengths – deriving value from investments in intangible assets such as R&D, software, design, brand equity and human and organisational capacities. These will demand high level STEM skills. Innovative low carbon service activities can be thought of as pulling together a number of technical aspects to create new product offerings to meet demands - again we can expect this to be associated with demands for high level skills.

The nature of our low carbon economy will be determined by the balance that is achieved between these two groups of activity. Unfortunately our analysis shows that while we can be relatively confident of securing the first group of jobs, achieving the second set is a much more ambitious task. Implementation activities are likely to develop evenly across locations to serve local demands. In contrast, our analysis shows that the innovative high-value

activities will only develop in a small core of key locations – reinforcing places where initial strengths are rapidly converted into industrial advantage.

In our June report we argued that in this area the implementation of policy under the previous government was confused and too nuanced despite a ground-breaking commitment to the agenda. It struggled to translate long term commitments into frameworks that could foster confidence and support business investment.

The Coalition government has clearly been looking to tackle this issue. Spending for the Department for Energy and Climate Change (if not for related areas) has been protected, energy market reform has been presented as a way to build markets that can support investment, and the Green Investment Bank has the potential to really drive investment in innovative businesses and technologies (even if its scale is limited by a political commitment to our national debt). However, the real test for these initiatives will come in the implementation of policy.

A change however that has withdrawn support for the development of an innovative low carbon activity is the abolition of the Regional Development Agencies. In addition to their direct investment in the research and development of innovative technologies, their operation at a strategic level facilitated a coordinated and networked approach to low carbon activities within regions. In addition they channelled targeted European Structural Funds such as the ERDF, which were used to specifically boost innovation in the low carbon economy in some cases (in the East of England for example). It is unclear whether the combination of the Green Investment Bank and Local Enterprise Partnerships will be able to fill this gap, and if the new governance structures will operate at the correct geography to coordinate low carbon infrastructures and supply chains.

Continued action to implement low carbon policies in a coordinated way within a structured framework will be critical to developing the business confidence to allow us to convert Britain's advantages into true industrial strengths. Low carbon industry needs certainty to invest and strong leadership.

Reference point: *A 2020 Low Carbon Economy* (June 2010); *What will a low carbon economy in the East of England look like in 2020?* (March 2011)

Backing our Creative Industries

Backing our creative industries will require the government to offer clarity on the sector's economic potential and its support. Our creative industries have a reputation as a world-leading area of strength, but the recession has had a dramatic impact on the sector at the same time as it looks to respond to global industry change. Businesses face challenges from globalisation, digitisation and internationalisation. Creative industries need to be placed at the heart of the government's thinking on innovation – there is a strong case for their inclusion within the TICs initiative, and for expanding the recently announced 'patent box' to cover copyright as this is of more relevance for creative industries.

The UK creative industries as a growth sector

The creative industries have rightly been identified as a key driver of value in the UK economy: the UK creative industries constitute 7.3 per cent of the UK economy, and 6.4 per

cent of UK Gross Value Added – equivalent to £57billion. The creative industries in the UK employ more than 1.2 million – more than pharmaceuticals and financial services combined. These figures place the UK creative industries as the highest percentage of any overall OECD economy. Furthermore, research indicates the potential for a 9 per cent growth rate in the UK creative industries, and 4 per cent employment growth rate – well above the all-sector average for the UK.

These numbers, however, underplay the important spillover role that the Creative Industries hold at the heart of the economy, acting as a driver of creativity, innovation and entrepreneurship across the UK economy as a whole. From the early adoption of innovative technologies and business models for creative uses, to providing creative input to other industries, the Creative Industries are a catalyst for growth across the innovation ecosystem.

Yet, the area has faced mounting challenges over the past decade. Globalisation and digitalisation have meant the UK is at risk of losing its advantage. Furthermore, many other nations have recently been actively pursuing industrial strategies which boost their creative industries. International competitors in Asia are many years from challenging the strength and scale of the UK creative industries, but nevertheless they are growing at a much faster pace – UNCTAD reports global trade in creative goods as 47 per cent higher in 2005 than in 2000. Key future competitors are also pioneering innovative mechanisms for developing their creative industries. For example Taiwan is channelling US\$840 million of public money to creative businesses through venture capital firms. These factors leave the UK at risk of being left behind and our creative industries will be ill-equipped to fulfil their pivotal role as a driver of innovation across the knowledge economy.

The recession significantly affected the Creative Industries; for example the advertising industry in the UK saw its greatest-ever proportional decrease in revenue in 2009. Evidence from South East England Development Agency suggests it will take until 2020 for total employment in the creative industries to return to its pre-recessionary levels, even if the 2010s saw the same rate of employment growth as the 2000s. While the UK creative industries remain strong by international standards – and a thriving part of the UK's knowledge economy – there are a number of policy areas where the government must take action to maintain the sector's advantage in the future.

In December 2010, we called for the Government to take action to support the Creative Industries and recognise their important role. We called for the UK Creative Industries to have a stronger voice to government; for the UK to improve its understanding of how the Creative Industries drive broader innovation; to improve the pipeline of creative industries innovations becoming successful global businesses; and for the Coalition to provide fiscal encouragement for investment in new Creative Industries innovation, and to repatriate profits from those innovations to the UK.

Disappointingly, the representation of the creative industries to the government remains poor and fragmented. The Coalition government's inclusion of 'Digital and Creative Industries' in its multi-sector Growth Review is to be welcomed. Following our recommendation of the convening of a 'Creative Industries Council', the formal recognition of such a body by government represents a positive move to recognise those issues that affect the creative industries as a whole, improving the sector's voice and visibility within government. Crucially,

the power, remit and operation of the Council is yet to be determined: the government must lend real support to the council, both as a representative body, and by utilising its convening power to encourage industry to work together on its more intractable issues, such as copyright.

In order to maximise the important role of the creative industries in driving growth, the UK must commit to understanding their interplay within the wider knowledge economy. Having led the world in the economic analysis of the creative industries, the UK is now in danger of falling behind. The government must accelerate its efforts in valuing and evaluating the creative industries in order to keep pace with the changes to the industry being wrought by the trends towards digitalisation, internationalisation, and technological convergence. Commercial research efforts have fallen short in filling this gap and government must step up to take on this role. The Work Foundation welcomed the recently announced funding for an 'Copyright and business models' centre as a step in the right direction, but moving forward UK statistics on the creative industries must take better account of the UK's role in this area within inherently global markets, value chains and business models. We concur with the recent government-commission review on intellectual property and growth (the Hargreaves Review) which explicitly called for improved management information on the creative industries, which would be fit for the 21st global, digital context.

The UK must improve its understanding of how to convert its world-leading creativity and innovation in creative industries into successful UK and global businesses. NESTA has made great strides in this area in recent years, but, given the sector's importance to the UK economy, we urge the Technology Strategy Board to focus one of the three remaining Technology and Innovation Centres on the digital and creative industries.

The Hargreaves Review also makes sensible suggestions towards increasing the competitiveness of the UK intellectual property – for example in proposing a simplified digital copyright exchange mechanism for establishing and trading rights. We believe the government should also look to creative fiscal solutions, as it has done for some other key innovation-driven industries. 'Patent box' tax breaks, which support both research and development investment, and the repatriation to the UK of profits from that innovation, are to be welcomed. However, the refusal of the government to consider the extension of patent box tax breaks to include copyright products signals a worrying inertia within government. Enabling the creative industries to maximise its position as a key sector for the UK knowledge economy will depend on the government locating these activities at the centre of its thinking on innovation.

Reference point: *A Creative Block?: The future of the UK creative industries* (December 2010)

Turning the UK into a world leader in manu-services

Turning the UK into a world leader in manu-services will require the government to re-consider the way it thinks about the manufacturing sector. Manufacturing is vital to the knowledge economy, but policy cannot continue to focus on high-tech manufacturing alone. All parts of the UK manufacturing industry can thrive, but only if they take advantage of the UK's strong service economy. To make this happen, government must develop an evidence base for manu-services, provide integrated support to manu-service firms, and ensure that universities work with manufacturers on business models as well as technology.

The manufacturing industry is undergoing fundamental changes. Manufacturing is no longer just a case of making things, but is steadily becoming more and more integrated with the service delivery. Manufacturers are increasingly moving towards a new business model, in which they focus on meeting each customer's needs more completely. Manufacturers are no longer just mass producers; they sell outcomes and experiences as well as products.

This shift towards "manu-services" presents a huge opportunity for the UK. Despite decades of relative decline, manufacturing remains vital to the UK economy; it is a major investor in innovation, and by far and away the largest export sector. Without a strong manufacturing sector, the 2020 knowledge economy is very unlikely to be balanced, and would have a severe permanent trade gap. However, the UK's efforts to specialise in high-tech manufacturing to stay internationally competitive are unlikely to achieve this. Britain's high-tech manufacturing base has contracted twice as fast as low-tech manufacturing over the last three years (shedding a third of its jobs between 2007 to 2010), and can no longer be the UK's key source of competitive advantage in manufacturing.

In contrast, manu-services are emerging as a potential new source of competitive advantage for UK manufacturing. Britain's manufacturing industry is already highly service-oriented; just 45 per cent of manufacturing jobs in the UK are in production roles. This suggests that the UK's manufacturing base is far more oriented towards manu-services than high-tech manufacturing. The latest evidence suggests that 28 per cent of UK manufacturers have adopted manu-services, while manufacturers estimate that they generate 15 to 20 per cent of their revenue from services.

Manu-services involve a fundamentally different business model, in which firms interact more closely with the customer, produce bespoke goods and create packages of complementary services to fit each customer's needs. By integrating a range of services into the manufacturing process, businesses can open up a whole new area of growth. Manu-services tend to be associated with longer contracts and higher revenues, enabling manufacturers to "lock-in" their customers. If the UK can succeed in this area, building on its existing strengths, the manufacturing sector could start to grow once more after years of stagnation. This new-look manu-services sector must be a productive, export-facing anchor for the economy by 2020.

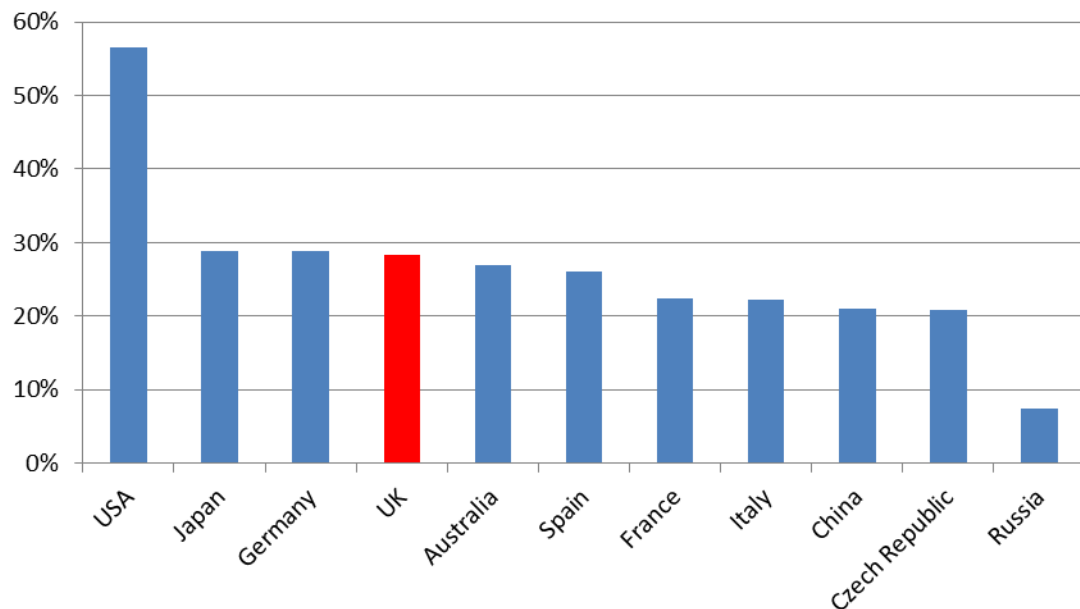
Manu-service companies face some significant challenges in moving to this more flexible way of doing business. Coordinating manufacturing and services effectively is difficult and costly, while customers are not always willing to pay the full cost of complex packages of goods and services. Surprisingly, these challenges appear to be particularly acute for the largest manufacturing companies – but these large companies are also more likely to make the transition to manu-services. This raises an awkward dilemma: the smaller companies

The importance of a knowledge economy strategy

that are most likely to prosper as manu-service firms are less likely to move into manu-services in the first place.

There is no room for complacency over the UK's future in manu-services. Other countries, including China, are rapidly expanding their manu-service activities; recent research conducted by Neely suggests that the proportion of manufacturers in China offering services increased from 2 per cent to 20 per cent between 2007 and 2009. Although this result should be treated with a degree of caution – it is not clear how much of this is driven by OECD based companies operating in China, and this result may be influenced by changes in the ways in which companies choose to market themselves – it does suggest other countries may be catching up. The chart below shows that the UK has some way to go in becoming a world leader in manu-services. If the UK is to excel in manu-services, effective government support for transition will be important.

Proportion of servitized manufacturing firms, by country



Source: Reproduced from Neely (2010). Data from 2009.

There is a clear case for the government to facilitate the development of manu-services; it is the only way that the UK's vital manufacturing industry can continue to compete and grow in an ever-more competitive global economy. However, our understanding of the needs and challenges associated with manu-services remains limited, and should be addressed as a matter of priority.

To ease the UK's transition towards manu-services, the government should take action in two key areas:

1. **Building networks and platforms that support innovation in services and business models** – this involves getting the different institutions within innovation

The importance of a knowledge economy strategy

networks – universities, banks, intermediaries and regulators – to focus more on non-technological innovation; and

2. **Giving smaller manu-service firms the tools they need to grow** – smaller firms face a range of barriers to entering and growing within manu-service markets, and government must tackle these barriers and provide targeted support to help firms fulfil their growth potential.

But this action is held back by a general lack of understanding of manu-services. Despite these trends having been identified by academics over 20 years ago, there has been relatively little research and evidence collected on manu-services. This is something the government should seek to address as a priority.

Beyond that, there are a number of policy interventions that should be used to support the growth of manu-services. The new Technology and Innovation Centres must be able to focus on how technology and services can be integrated, helping the UK to develop new types of manu-service. Equally, organisations such as UKTI and Local Enterprise Partnerships should look at how they can facilitate the networks that support non-technological innovation in manufacturing, while promoting manu-service exports.

There may also be a role for government to help smaller firms overcome barriers to entry in manu-services. The Manufacturing Advisory Service's role in supporting business model innovation should be expanded to include all elements of manu-services. The government should also look at how it can provide integrated support to smaller manu-service firms, helping to deal with the joint challenges of access to finance, managing risk and designing effective business models.

Reference point: More Than Making Things: A new future for manufacturing in a service economy (March 2011)

Securing the UK's advantage in business services

Securing the UK's advantage in business services will require the government to ensure that all businesses and public sector organisations are encouraged to invest in knowledge and intangible assets to drive innovation. Equally, the government must ensure that the UK generates enough intellectual property, provides enough highly skilled workers, and creates a transparent institutional framework for the business services sector to grow and remain competitive.

Business services are the UK's biggest economic strength. As the economy's largest and fastest growing sector, business services will be one of the driving forces behind recovery. They are both a major source of employment, and a high value-added part of the economy (GVA per employee is higher than for financial services). They have created 1.8 million jobs, and contributed 38 per cent of all economic growth in Britain since 1970. And the UK has a large trade surplus in business services – comfortably the largest in the world – mitigating the UK's severe strategic trade gap.

Despite these obvious strengths, business services tend to be obscured by the (much smaller) financial services sector. This represents a serious misunderstanding of the UK economy by policy makers, because financial services represent a far smaller share of UK

output, provide few jobs (less than 4 per cent of total employment) and have experienced little real growth since 1985. This under-appreciation of business services owes much to the fact that it's very difficult to pin down exactly what business services do. The label "business services" covers a wide variety of activities, from lawyers and consultants to computer programmes and advertisers. Despite their diversity, these services are united by the fact that they trade solely in knowledge and intangibles, and rarely produce any kind of tangible output.

This makes business services extremely important; in many ways, they are the basis of the knowledge economy, and form a key part of its infrastructure. The knowledge economy is characterised and driven by growing business investment in intangible assets, and business services are the main provider of these intangible assets. These activities create value by developing and exploiting intangible assets – design, brands, human and organisational capital in particular – in ways which meet the needs of other businesses. They therefore should be seen as significant investors in the intangible assets that underpin our economy, as well as creating a knowledge infrastructure that facilitates the operation of other knowledge-intensive businesses. Business services are the key under-pinning of the knowledge economy, a bellwether of its health and central to its future.

The UK should aim to sustain and build on the strength of its business services sector. It is one of the key engines of job creation and economic growth we have, and this should be exploited as far as possible. This means maintaining Britain's competitive position, by boosting competition, productivity and sales. There is also scope to dramatically increase exports of business services, by building links between UK firms and overseas markets. At the same time, the government should aim to translate the sector's success into more jobs, and ensure people have the skills needed to fill these jobs.

There are four key factors that will determine the future growth of the business services sector:

1. **Business investment in intangible assets** – as long as UK businesses continue to invest in intangible assets, the business services sector will continue to grow, as this is the key driver of demand for them;
2. **Export performance** – if the business services sector can become more competitive and more export-facing, it can secure additional demand from overseas markets;
3. **Securing the UK's knowledge base** – there is scope to improve links between universities and business service firms, and to boost investment in developing unique IP among business service firms; and
4. **Increasing the supply of highly skilled labour** – business services employ a high proportion of graduates, and will require a continual increase in the supply of highly skilled labour if it is to continue growing.

The first and last of these points are fundamentals of the knowledge economy, and are dealt with at greater length elsewhere in this paper. The challenges of promoting exports of business services and securing the UK's knowledge base in services require specific policies.

Promoting exports of business services will require UKTI and the Foreign Office to continue their good work in improving links between UK businesses and overseas markets. This work should be complemented by working with smaller business service firms in the UK to encourage them to be more export-facing. Equally, the government should continue to push for the completion and full implementation of the EU Services Directive, and other global trade agreements. There is a danger that the government's immigration policies may also inhibit the flow of people that is so vital to trading in business services, and such activities should be afforded special protection.

At the same time, the government must ensure that investment in the knowledge base that supports business services is maintained. This partly depends on creating a stable environment for businesses to invest in R&D – something the government has shown a strong commitment to – and partly depends on making the best use of public funding.

Reference point: Britain's Quiet Success Story: Business services in the knowledge economy (May 2011)

Towards a plan for the knowledge economy

The knowledge economy is our only option; we cannot turn the clock back to an economy based primarily on low-skilled jobs without an enormous drop in our living standards. Our knowledge industries are the only viable and to sustained prosperity. If we fail to build on our current strengths here, we risk committing ourselves to a decade of stagnation, with unemployment remaining stubbornly high.

As we set out above, the government has made a number of important commitments to the knowledge economy, but it has also been caught looking both ways. Some of the government's most expensive policies have been based on an outdated view of the UK economy. The knowledge economy has changed how our economy creates value, and how we create jobs. The blunt heavy lifting policy tools – sweeping tax breaks and blanket reforms – of the old economy are no longer up to the job. In many respects, these measures are the equivalent of using a cannon to block a cyber attack.

Building on our research and the evidence presented through this paper we have set out a plan for how the government should fully commit to the knowledge economy based on the three key building blocks of this activity:

People – knowledge workers sit at the heart of the knowledge economy story and will drive its development. Ensuring that our economy has a strong supply of the right knowledge workers is a fundamental pre-requisite for any growth here – without suitable knowledge workers, there can be no new jobs in the knowledge economy:

- The government must continue its reform of higher education funding, enshrining two principles – an ability to sustain expansion in numbers in the future, and the introduction of strong incentives for teaching excellence; and
- At the same time, we need to remain open to the global talent that can strengthen our knowledge economy. This will demand a change in the tone coming from our leaders to offer confidence for those looking to invest in the UK that they will be able to access the best talent the world has to offer.

Firms – enterprises in the knowledge economy create value by exploiting intangible assets such as research, brands or human and organisational capital. In many cases this creates the potential for explosive growth. Putting in place the conditions within which such organisations can succeed will be critical to our success:

- Supporting business investment in the full breadth of intangible assets will be a key enabler of continued knowledge economy success – action on R&D tax credits and the patent box is positive, but broader actions is required to support all forms of investment in intangible assets;
- The government plays an important role in making markets by building frameworks which can support long term investment in our future knowledge economy. Seen most clearly in the case of the low carbon economy, the government needs to fully commit and engage with this role;
- For high growth firms, the local conditions faced are especially important for success – this heightens the importance of action to ensure that the basics of economic development are in place. This will depend on continued action to ensure that LEPs

can develop as effective strategic and practical bodies, capable of acting as a link between local enterprise and public policy; and

- This must be complemented by action to overcome systemic weaknesses in the leadership and management skills within our fast growing SMEs. LEPs provide a new opportunity to deliver new forms of support here. The creation of a LEP led Local Enterprise Leadership Fund would be an opportunity to strengthen and also to rationalise the existing, confused system of business support.

Knowledge infrastructures – the market for knowledge is far from perfect. More than for traditional markets there is a role for public investment in the infrastructures that actually support the knowledge economy. In the traditional economy these infrastructures include roads, rail and telecommunications. Stronger investment in the infrastructure for our knowledge economy would involve:

- Sustaining public investment in research and science – a strong research and science base is a vital underpinning component of our knowledge economy. In addition to maintaining spending here, continued reform must play an important role in driving entrepreneurship and ensuring that our research base fully connects to and engages with our economy;
- A core group of business services can be thought of as knowledge infrastructures – they create value by providing services that allow the operation of other knowledge-intensive businesses. These businesses will be driven by the broader conditions of our knowledge economy, but making a true commitment to this vital group of knowledge-based business services would involve greater support for export oriented SMEs in this sector; and
- Ensuring that our public services provide the best possible infrastructure for our knowledge economy. The nature of interaction between the public and private sectors is instrumental in driving innovation – a shift from adversarial engagements towards more collaborative arrangements would better support the co-development of innovative new products and services as well as the easier transfer of best practice. In many areas this will demand sustained efforts to build effective public and private institutions that are capable of nurturing and supporting innovation within public supply chains.

It is not possible to understate the importance of this action. Without the right backing we risk losing our current knowledge economy advantages. Without an unambiguous commitment here we can not expect lasting economic growth.

The future of knowledge economy research

As the Coalition continues to test and develop policy in this area we think there will be an even clearer need for precise independent guidance. We think that the next three big questions facing the knowledge economy are:

- **How can we handle the big distributional and structural impacts of continued progress to the knowledge economy?**

The rise of the knowledge economy is impacting differently on different individuals and places; it favours high skill individuals, reinforces existing economic advantages and appears to drive polarisation. Without proper consideration of how to respond to these issues, further development may become either socially or politically unsustainable.

- **How can we apply what we have learnt about the UK on a global stage?**

Central action to promote an EU knowledge economy lacks ambition and appears to be stalling. Yet policy and strategy here impacts directly on our knowledge economy, and will play a role in delivering strong and vibrant knowledge-based activities in many of our most important trading partners. A vital question for the UK also remains how to better connect to global knowledge trades.

- **How can we nurture the UK's innovation ecosystem?**

The Knowledge Economy 2 programme identified many of the components of a UK innovation ecosystem, and our paper *Innovation, Creativity and Entrepreneurship 2020* explored how these relate. The Work Foundation is now embarking on a major research programme to describe in detail how policy and organisational strategy could act to build a stronger innovation ecosystem.

If we are to support the continued development of a strong and sustainable knowledge economy then we must answer these questions. Building consensus around these issues will be critical to our future prosperity.

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